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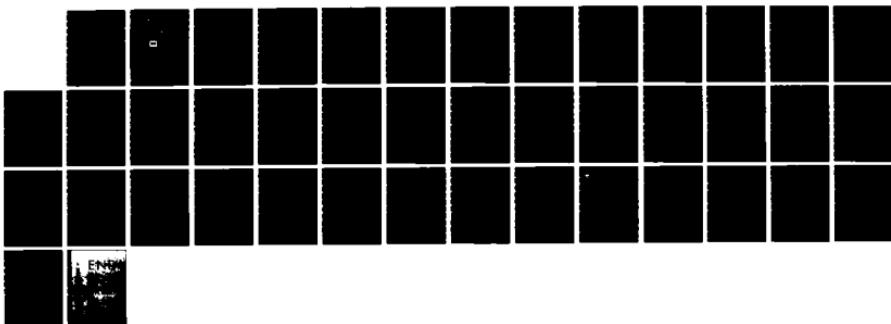
RECONNAISSANCE REPORT FOR CRAB TREE SHAMP CITY OF
CONWAY Horry COUNTY SOUTH CAROLINA(U) CORPS OF
ENGINEERS CHARLESTON SC CHARLESTON DISTRICT

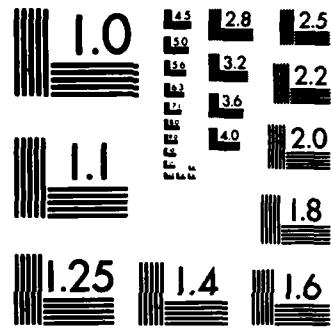
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Interim Report

**RECONNAISSANCE REPORT
FOR
CRAB TREE SWAMP
CITY OF CONWAY
HORRY COUNTY, S.C.**



**US Army Corps
of Engineers**
Charleston District

**SECTION 208
OF THE
1954 FLOOD CONTROL ACT
AS AMENDED**



NOVEMBER 1982

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
		A132 222
4. TITLE (and Subtitle) Reconnaissance Report for Crab Tree Swamp, City of Conway, Horry County, South Carolina		5. TYPE OF REPORT & PERIOD COVERED Interim
7. AUTHOR(s) U. S. Army Corps of Engineers Charleston District P.O. Box 919, Charleston, S.C. 29402		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Corps of Engineers/SACEN-PS Charleston District P. O. Box 919, Charleston, S. C. 29402		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Corps of Engineers, Charleston District Study Management & Formulation Section-SACEN-PS P.O. Box 919, Charleston, S.C. 29402		12. REPORT DATE November 1982
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		13. NUMBER OF PAGES 27
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE Unclassified
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release: distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Flood Control		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The city of Conway, S. C. requested and the Corps of Engineers performed this reconnaissance study to determine the extent of flood problems along the Crab Tree Swamp, Horry County, S. C., and to determine federal interest in solving this problem. This report indicates there is a sufficient problem for which a potential solution exists that warrants further federal investigation.		

CRAB TREE SWAMP, Horry County, South Carolina

Section 205 Reconnaissance Report

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1	Letter of Request - City of Conway
2	U.S. Fish and Wildlife Reconnaissance Report
3	Work Item Summary
4	Study Network

SACEN-PS

SUBJECT: Reconnaissance Report, Crab Tree Swamp, Conway,
Horry County, South Carolina

Commander, South Atlantic Division
Attn: SADPD-P

AUTHORITY

1. This reconnaissance report was prepared under authority contained in Section 205 of the 1948 Flood Control Act, as amended. Subject report was initiated by letter to SADPD-P dated 24 May 1982, subject "Crab Tree Swamp Canal, Conway, Horry County, South Carolina." The City of Conway is the local sponsor and requested flood control assistance by letter dated 9 September 1981. (See inclosure 1)

SCOPE OF STUDY

2. This report was prepared using readily available data, supplemented where necessary with additional field surveys and in house studies. The purpose of this report is to determine the magnitude of existing water

resource problems and the feasibility of further Federal involvement in formulating solutions to the problems. Due to the nature of this report, information contained herewith is considered preliminary and subject to revision should detailed investigation be authorized.

PRIOR REPORTS

3. The Crab Tree Swamp Canal Project was authorized by OCE on 16 November 1964, under Section 208 of the 1954 Flood Control Act. The project included clearing and snagging short reaches of Kingston Lake Swamp and Smith Lake Swamp below South Carolina Highway 106, for a total of approximately one mile in length and 50 feet in width. It also provided for an enlarged channel from S.C. Highway 106 along the run of Crab Tree Swamp to the confluence of Crab Tree and Fourmile Swamps. The improved channel has total length of approximately 4.5 miles and varies in bottom width from 10 to 50 feet. The project was designed as a flood control and major drainage project that would prevent agricultural damages caused by floods equal to the 3-year frequency. The project has a 20-year project life and was completed in Fiscal Year 1966.

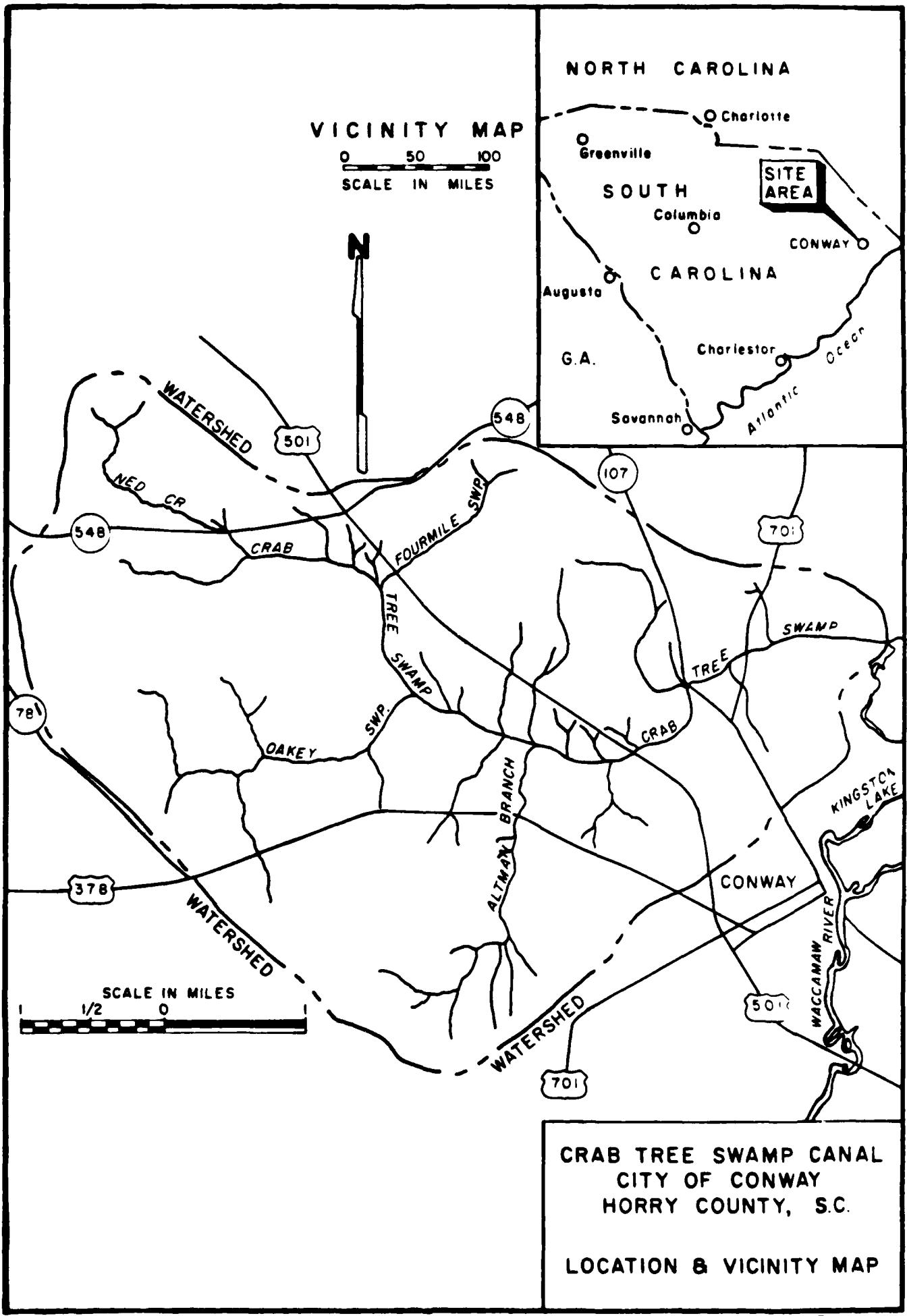
4. At the request of the City of Conway and endorsement by the S.C. Department of Water Resources, a Flood Plain Information Report was prepared for the City of Conway and published in March, 1973. This report was prepared by the Charleston District under continuing authority provided in Section 206 of the 1960 Flood Control Act, as amended. This report included the Waccamaw River, Kingston Lake Swamp, and Crab Tree Swamp.

BASIN AND STUDY AREA DESCRIPTION

5. The Crab Tree Swamp Watershed is located in Horry County, South Carolina, within the Waccamaw River Basin. The lower end of the watershed is located within the city of Conway and extends five miles east of the city along U.S. Highways 501 and 378. The watershed is 11,520 acres in size, with approximately 1,280 acres in the city limits of Conway. The main stem of Crab Tree Swamp flows eastward along and enters Kingston Lake Swamp approximately at the northern edge of the Conway City limits. Kingston Lake Swamp discharges into the Waccamaw River in the vicinity of U.S. Highway 501 bridge which crosses into the City of Conway. The swamp is broad, flat, and heavily wooded throughout its length. Several small tributaries discharge into Crab Tree Swamp and contribute to flow. A location and vicinity map of the basin is shown on Figure 1.

TOPOGRAPHY AND SOILS

6. The maximum elevation within the watershed is approximately 40 ft. NGVD, with an average elevation of about 15 feet NGVD near the outlet end of Crab Tree Swamp. The general topography of the watershed is nearly level to slightly sloping with the sloping areas located generally along the edge of the flood plain. Slight depressions are scattered throughout the area and are a distinct feature of the landscape. These shallow depressions do not have natural outlets and consequently pond water during periods of heavy rainfall. The soils range from sandy loam soils to heavy sandy clay soils. They have a



moderate to slow infiltration rate which results in rapid runoff during periods of high intensity rainfall. The soils generally have a high water holding capacity and require both surface and internal drainage for profitable production of crops. Soils in the basin are productive and adapted to most crops grown in the area with good soil management practices. The soils are stable and present no special construction difficulties.

RAINFALL AND CLIMATE

7. A U.S. Weather Bureau Station is located at Conway, S.C. within the Crab Tree Swamp Watershed and has recorded rainfall data since 1888. According to records, the average annual rainfall at Conway during the period of record ranges from 31.81 inches in 1954 to 74.38 inches in 1964. The normal annual rainfall is 51.79 inches. Maximum rainfall for a single month was recorded in September 1979 at 16.89 inches. Greatest monthly rainfall usually occurs during February, March, July, and August. High intensity rainfall may also occur as the result of tropical storms during the late summer and early fall months. The mean average temperature in the area is about 64 degrees Fahrenheit.

DEVELOPMENT AND ECONOMY

8. The population of Conway increased from 8,151 persons in 1970 to 10,240 persons in 1980, an increase of 25.6 percent (See Table 1). Population is projected to increase to 12,698 persons by the year 2000, or an increase of 24.0 percent. Population has been increasing in the Conway suburbs which includes portions of the Crab Tree Swamp Watershed and in the adjacent rural areas of Horry County.

9. In 1976 about 27 manufacturing plants and several agri-business firms were located in the City of Conway. The principal crops grown in the Crab Tree Swamp Watershed are tobacco, corn and soybeans. Horry County ranks first among the 46 S.C. counties in value of crop production per county and also in the total number of farms per county according to the 1974 U.S. Census of Agriculture prepared by the USDA Economic Research Service.

TABLE 1

HISTORICAL AND PROJECTED POPULATION

	HISTORICAL			PROJECTED		
	1960	1970	1980	1985	1990	2000
CONWAY	8563	8151	10240	10916	11495	12698
HORRY COUNTY	68247	69992	101419	118191	132406	159500
STATE OF S.C.	2382.5	2590.7	3119.2	3283.0	3481.0	3809.0
(IN 1,000)						

Note: Historical data was taken from U.S. Dept. of Commerce, Bureau of the Census publications, "United States Census of Population, South Carolina, Number of Inhabitants, 1970" and "1980 Census of Population and Housing, Advance Reports, South Carolina, Final Population and Housing Unit Counts", March 1981. Projected data was obtained from S.C. State Budget and Control Board, Research and Statistical Services Division; and Waccamaw Regional Planning and Development Council, 1982. Projected data was also obtained from U.S. Dept. of Commerce, Bureau of Economic Analysis, "Memorandum to Regional Projection Users", March 23, 1981.

10. The South Carolina Budget and Control Board in the "South Carolina Statistical Abstract 1980" estimated the per capita income in Horry County to be \$6,174 for the year 1978. The 1981 estimate of income per household for Horry County was \$18,995. In 1980, the number of persons per housing unit was 2.8 (See Table 2).

TABLE 2

PERSONS PER HOUSING UNIT, CITY OF CONWAY

	1960	1970	1980	Percent Change 1970 to 1980
Population	8563	8151	10240	25.6
Housing Units	2500	2589	3647	40.9
Persons Per Housing Unit	3.4	3.1	2.8	

Note: Data was taken from the U.S. Dept. of Commerce, Bureau of the Census, "1980 Census of Population and Housing, Advance Reports, South Carolina, Final Population and Housing Unit Counts", March 1981

LAND USE

11. Residential acreage represents about 16 percent of the total acreage within the 100-year flood plain of lower Crab Tree Swamp located within the city limits of Conway. About 60 residences are located in this area. The commercial and industrial category, which consists of one grain elevator firm and two other businesses, represents less than one percent of the 100-year flood plain acreage. The remaining acreage in the 100-year flood plain is the undeveloped woodland and swamp areas adjacent to Crab Tree Swamp. This area represents about 83 percent of the total flood plain acreage(See Table 3). Land use in the upstream area of Crab Tree Swamp was not considered in this preliminary analysis, since the area is above the existing problem area. Agriculture and woodlands are the principle land use categories in the upstream areas of the Crab Tree Swamp Watershed.

TABLE 3

Land Use - 100-Year Flood Plain
Crab Tree Swamp Watershed within City of Conway

Land Use	Acres	Percent of Total
Residential	56.0	16.2
Commercial and Industrial	2.0	0.6
Woodland	287.0	83.2
	-----	-----
Total	345.0	100.0

Note: Acreages listed are within the corporate limits of the City of Conway and were estimated from existing Flood Insurance Rate Maps.

ENVIRONMENTAL CONSIDERATIONS

12. General Description. The Crab Tree Swamp Watershed is located in Horry County, South Carolina, within the Waccamaw River Basin. The lower end of the watershed is located within the City of Conway and extends approximately 5 miles west of the city generally along U.S. Highway 501. The watershed is approximately 11,500 acres in size with approximately 1,200 acres in the City of Conway. The main stem of Crab Tree Swamp Canal flows from east to west, past Conway entering Smith and Kingston Lake Swamps at about the northern edge of the City of Conway. Kingston Lake Swamp discharges into the Waccamaw River in the vicinity of the U.S. Highway 501 bridge crossing into the city.

13. Flora. Vegetation occurring within the study area is typical of Southern Coastal Plain flora. Overstory species predominating include sweetgum, blackgum, cypress, yellow poplar, sycamore, water oak, willow oak, loblolly pine, and long leaf pine. Understory and ground cover species include dogwood, privet, honeysuckle, poison ivy, virginia creeper, rushes, and plantains. Alligator weed is the most abundant aquatic species within Crab Tree Swamp.

14. Fauna. All wildlife species which occur in a typical suburban-wooded, coastal plain, watershed habitat can be expected to occur in the Crab Tree Swamp study area. No unusual or critical terrestrial habitat is known to exist in this study area.

15. Fish. Crab Tree Swamp is shallow and narrow in its upper reaches and would not support a significant fishery. In the vicinity of U.S. Highway 501 the canal has been widened to approximately 50 feet. The canal from this point on through Kingston Lake to the Waccamaw River has the potential to support a significant fishery resource. The upper reach of Crab Tree Swamp has a bottom consisting of sandy-clay with a covering of silt. Kingston Lake has a sandy silt bottom in the vicinity of the Waccamaw River.

16. Threatened and Endangered Species. There are no known endangered or threatened species in the study area. However, the lower reaches of the canal, Smith Lake and Kingston Lake Swamps, appear suitable for spawning by the endangered shortnose sturgeon. There is no designated critical habitat for any species within the State of South Carolina.

17. Cultural Resources. The National Register of Historic Sites does not list anything within the study area. There are no known archeological sites within the study area. An inspection of the area by members of the

study team did not reveal any significant cultural resources. A cultural resources reconnaissance will be included in any further study.

PROBLEMS AND NEEDS

18. Much concern has been expressed by the City of Conway in behalf of the residents of the city regarding the frequent flooding that occurs along Kingston Lake, Smith Lake, and along Crab Tree Swamps. The original Corps project on Crab Tree Swamp has provided much needed relief to agricultural interest in Horry County, but has insufficient capacity to provide relief to residential areas of the city. Streets and residential areas of the City of Conway are frequently flooded. This flooding also causes problems with the city's sewage collection system in certain areas of the city.

FLOOD DAMAGES

19. Flood damages from Crab Tree Swamp occur to private residences, businesses and to public facilities of the City of Conway. Yard and street flooding occur frequently in the area. Since no agricultural damages have been reported recently, agricultural damages were not evaluated for this report. A preliminary flood damage survey of the study area was conducted in July 1982. The first floor elevations of the structures were estimated from several street, bridge, and minimum first

floor elevations provided by the City of Conway. A City of Conway official also estimated the value of several residences. The base flood studied for the report was the August 1981 flood which has approximately a 10 year return frequency. Equivalent average annual damages for the lower Crab Tree Swamp area were estimated to be about \$23,000. Flood damages were estimated to be about \$27,000, \$181,000, and \$605,000 for the 10, 25, and 100-year flood events respectively.

IMPROVEMENTS DESIRED

20. Local interests desire Federal assistance in the identification and construction of a cost effective flood control project on Kingston, Smith Lake, and Crab Tree Swamps to alleviate flood damages in the lower areas of Crab Tree Swamp. Locals believe that there is insufficient hydraulic capacity in these lakes and canals, and that this lack of capacity contributes to their problem. The local project sponsor is aware of the requirements of sponsorship for projects authorized and constructed through the continuing authority program.

STUDY OBJECTIVES

21. The objective of this phase of investigation is to determine the feasibility of further Federal involvement in the water resource problems of the Crab Tree Swamp Basin. Should further study be

authorized, study objectives would consist of formulating and evaluating alternative measures to alleviate flooding and drainage problems in the City of Conway and to recommend the best course of action to alleviate these problems.

POTENTIAL SOLUTIONS

22. Several alternative measures to meet the problems and needs of the area are possible; however, some of these measures are not practical or economical. Possible solutions may be divided into two broad categories of structural and nonstructural. Structural measures are designed to modify floods by altering the natural environment. These measures include alternatives which reduce flood elevations, divert floods, change the timing and duration of floods or restrict floods from portions of the flood plain. Structural measures which ordinarily would be considered include reservoirs, levees, and channel conveyance improvements. Due to the relatively flat topography of the area and the length of the affected reach, channel conveyance improvements are considered to be the most promising of the structural measures. Nonstructural measures are designed to modify flood damage susceptibility and include modifications to the cultural environment by adjustment in the pattern and mode of land use by developmental policies and by assistance to affected individuals. Also, a combination of structural and nonstructural measures is possible.

NONSTRUCTURAL MEASURES

23. Nonstructural measures do not attempt to reduce or eliminate flooding, but are designed to regulate the use and development of the flood plain, thus lessening damaging effects of large floods. Nonstructural measures consist of subdivision regulations, zoning, building codes, flood proofing, evacuation, open space development and other measures to remove properties from the flood plain. The local governmental agencies are actively pursuing flood insurance studies and are enforcing flood plain development regulations. The alternative of modifying flood susceptible structures does not appear feasible in the Crab Tree Swamp Basin due to their location in reference to the flood plain, the demand for housing in the surrounding areas, and social objections to such measures.

HYDROLOGIC ANALYSIS

24. The hydrologic analysis for this report was based on regional frequency data prepared for similar watersheds and analyses performed for previous studies in the basin. There are no stream gages on Crab Tree Swamp Canal or Smith and Kingston Lakes. Flood flow frequency information is based on regional data gathered from coastal South Carolina gages. Flood flow frequency relationships developed for this report are based on a Log-Pearson Type III frequency distribution with an adopted skew coefficient of zero. Discharges for several locations and return frequencies adopted for this study are shown on Table 4.

TABLE 4

CRAB TREE SWAMP

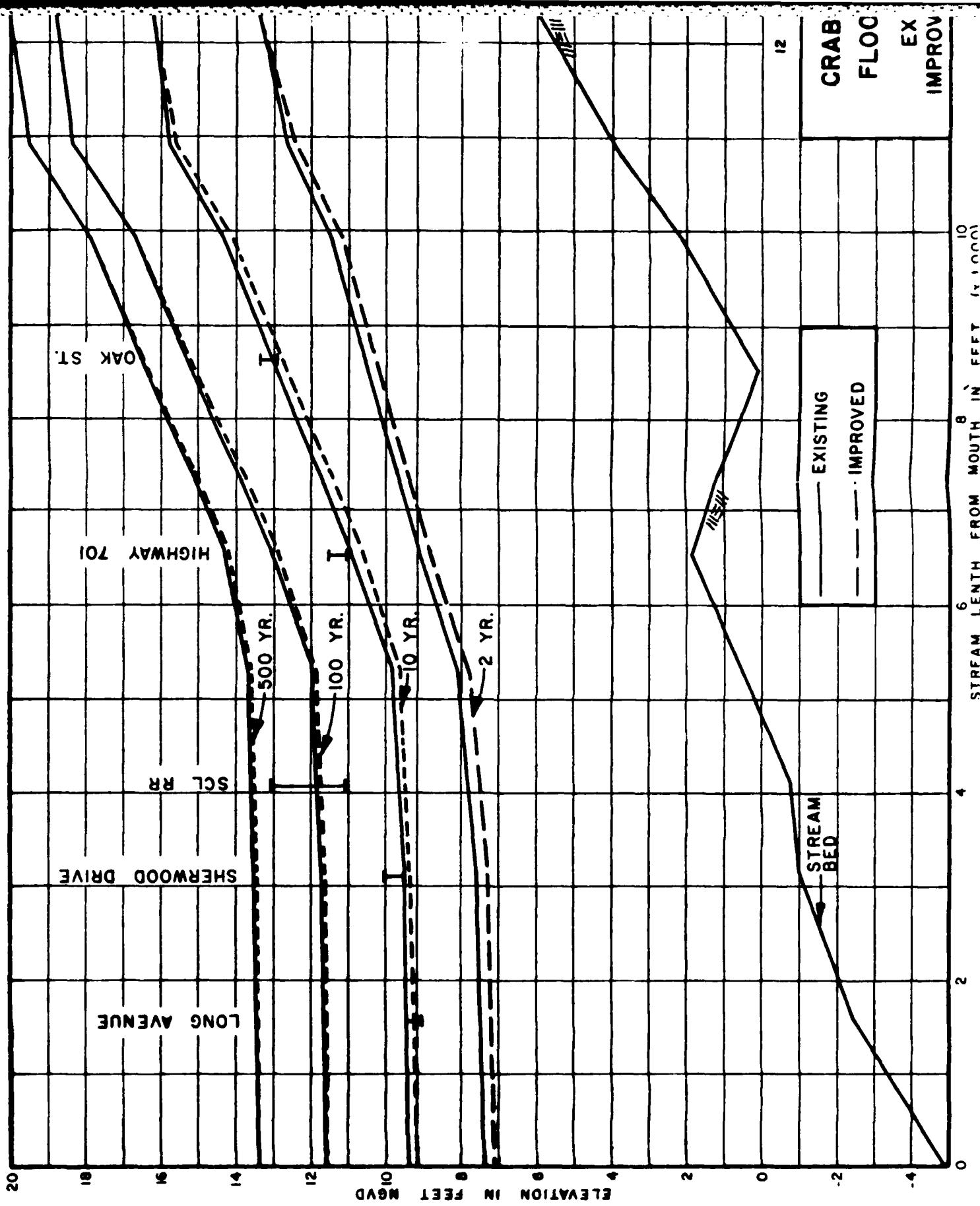
ADOPTED DISCHARGES

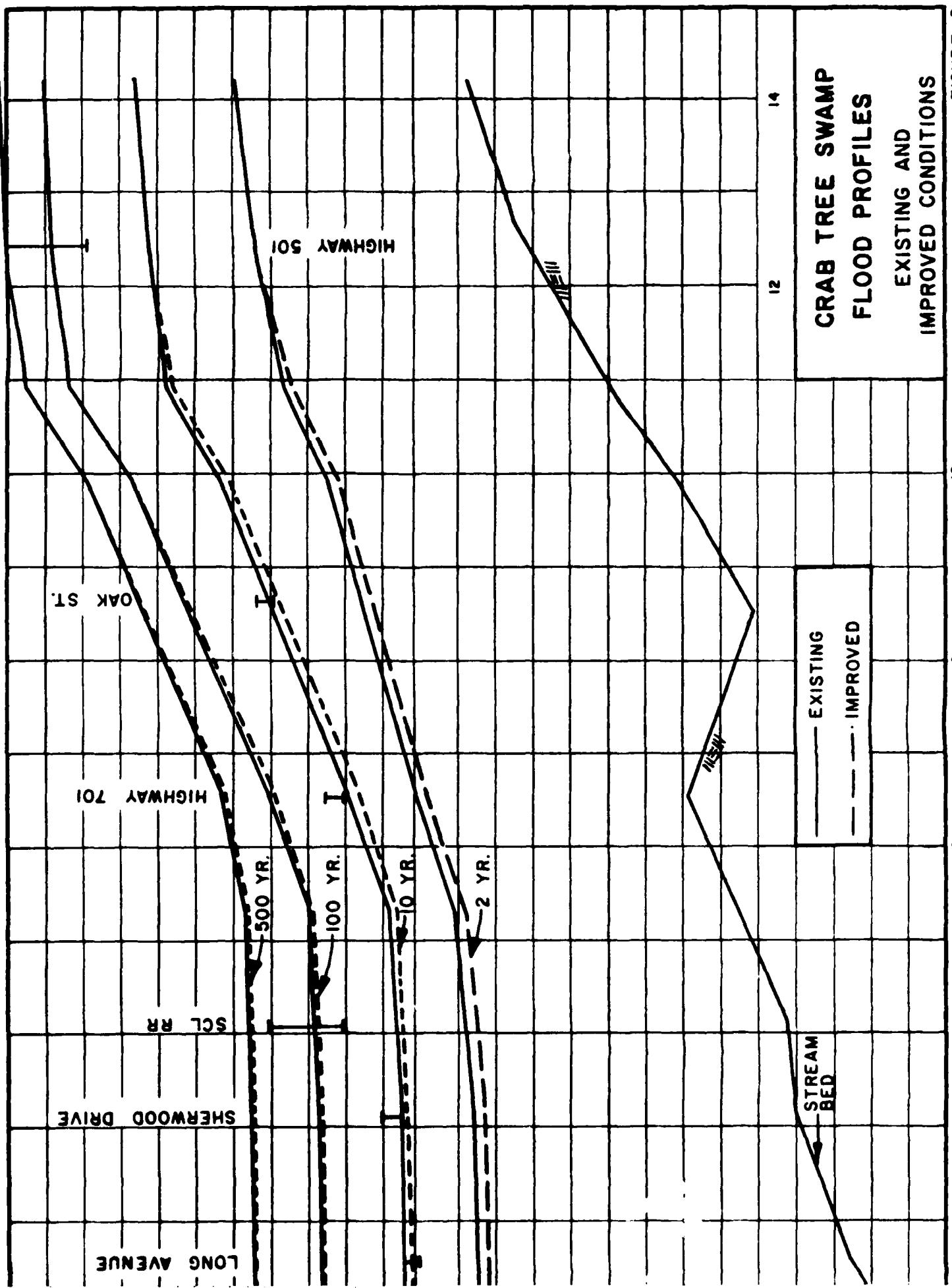
Location	Sq. Mi.	D.A. in	RETURN FREQUENCY IN YEARS					
			2	10	25	50	100	500
Crab Tree Canal								
at Hwy 501	7.6		370	840	1190	1500	1850	2800
Crab Tree Canal								
at Mouth	18.0		550	1140	1570	1950	2370	3500
Kingston Lake Swamp								
below Mouth Crab Tree	114.5		1140	1970	2490	2900	3350	4450
Kingston Lake								
at Mouth	135.0		1810	3050	3850	4450	5150	6800

HYDRAULIC ANALYSIS

25. Hydraulic studies were performed using an HEC-2 backwater model developed for the flood insurance study previously described. Starting water surface elevations were based on stage-frequency relationships for the Waccamaw River at Conway, S.C. This stage frequency relationship was derived from the USGS gage on the Waccamaw River at Conway which is located just below the confluence of the Waccamaw River and Kingston Lake. Manning's "n" values were selected based on appropriate technical guidance and an onsite field reconnaissance. Manning's "n" values ranged from 0.045 for open channel areas to 0.180 in very thick overbank areas for existing conditions. Existing condition profiles for the 2, 10, 100, and 500-year floods are shown on Figure 2 for Crab Tree Swamp Canal.

26. The total economic damages and the very flat hydraulic gradients between the Waccamaw River and the damage reaches on Crab Tree Swamp limited the potential structural solutions. Considering all available data, it was concluded that channel clearing and snagging was the only viable solution to improve the existing conditions. A field inspection was made by boat from the Waccamaw River to the lower reaches of Crab Tree Swamp. Significant constrictions to flood flows were observed in Kingston and Smith Lake Swamps as well as in the vicinity of the mouth of Crab Tree Swamp. The selected reaches for clearing and snagging are shown on Figure 3 with the recommended project described in subsequent paragraphs. These improvements were coded into the existing HEC-2 backwater model by reducing Manning's "n" values for the improved reaches to reflect the cleared channels. Selected "n" values for the improved reaches were 0.070. Improved water surface profiles for the 2, 10, 100, and 500-year floods are also shown on Figure 2. The improvements recommended will reduce the water surface difference between the Waccamaw River and the lower reaches of Crab Tree Swamp by





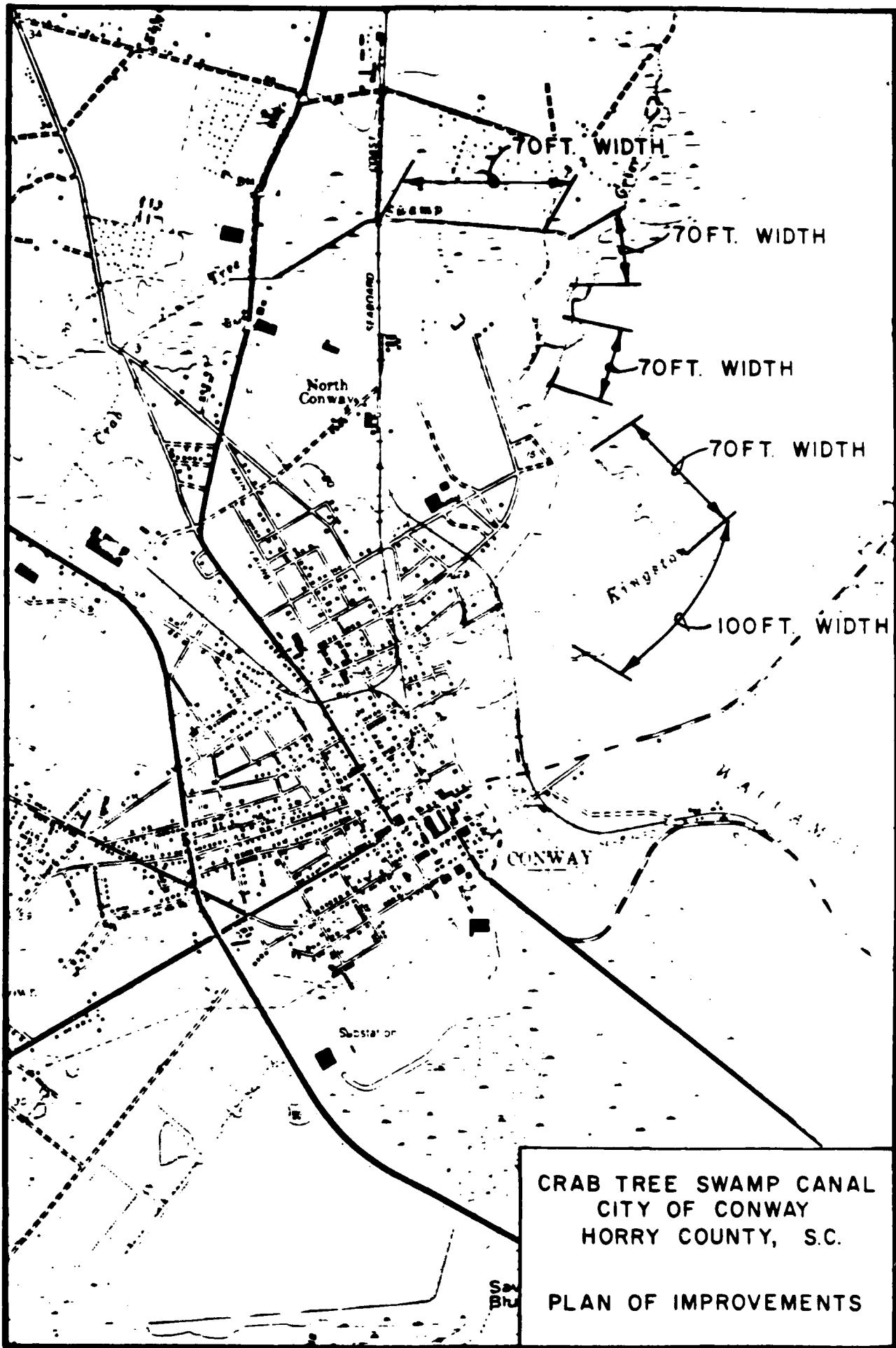


FIGURE 3

lowering the hydraulic losses in Kingston and Smith Lake Swamps. The resulting lower water surface elevations through the improved reaches will improve the hydraulic efficiency of Crab Tree Swamp and reduce flood damages.

RECONNAISSANCE PLAN OF IMPROVEMENT

27. Based upon reconnaissance evaluations the project which appears most feasible includes the selective clearing and snagging of a 2,500 foot reach 100 feet wide from a point 1,000 feet upstream of the railroad bridge crossing Kingston Lake. Three additional reaches along Kingston and Smith Lake Swamps would be cleared to a width of 70 feet for an additional length of 4,500 feet. The upper most reach to be cleared is a 2,000 foot reach in Crab Tree Swamp that would be cleared for a width of 70 feet also. The reaches to be improved are shown on Figure 3 and amount to a total of 2,500 feet to be cleared to a width of 100 feet and 6,500 feet to be cleared to a width of 70 feet.

ECONOMIC BENEFITS

28. Equivalent average annual flood control benefits for the project were estimated to be about \$11,000 leaving a residual annual damage of about \$12,000. Probable remaining damages with the project in place were estimated to be about \$11,000 for the 10-year flood, \$126,000 for the

25-year flood, and about \$529,000 for the 100-year flood. The 10-year flood would be reduced about 60 percent while the 25 and 100-year floods would be reduced by about 30 and 12 percent respectively. Later detailed field surveys should provide for improved damage and benefit estimates.

PROJECT FIRST COST

29. Clearing and snagging of approximately 9,000 feet or 1.7 miles of Kingston and Smith Lake Swamp and Crab Tree Swamp would have a total estimated first cost of \$90,000. A cost break down is given in Table 5.

TABLE 5

COST ESTIMATE - PRELIMINARY PLAN OF IMPROVEMENT
CRAB TREE SWAMP, Horry County

Item	Quantity	Unit	Price	Cost
Mob. and Demob.	1	job	L.S.	\$ 6,000
Clearing				
a. Upstream of R.R.				
Bridge on Kingston Lake	0.47	mi.	\$40,000	\$18,000
b. Along Kingston Lake	0.85	mi.	\$20,000	\$17,000
c. Along Crab Tree Canal	0.38	mi.	\$10,000	\$ 3,800
Lands	17	acre	\$ 500	\$ 8,500
SUBTOTAL				\$ 54,100
CONTINGENCIES (25%)				\$ 13,500
SUBTOTAL				\$ 67,600
Engineering and Design				\$ 13,400
Supervision and Administration				\$ 9,000
TOTAL FIRST COST				\$ 90,000

COST APPORTIONMENT

30. Apportionment of project first cost for the purpose of this reconnaissance evaluation has been accomplished in accordance with traditional procedures. Following these procedures, the local project sponsor would be required to furnish necessary lands, easements and right of way, plus any necessary bridge or utility modifications. The current estimated local share of project first cost is approximately \$10,600. The local sponsor must also provide annual project maintenance estimated to be \$2,200 annually. The federal government would provide a cost necessary for feasibility studies and detailed designs. Actual cost of construction would also be a federal responsibility. The current estimated federal share of project first cost is \$79,400. Total federal expenditures cannot exceed the jurisdictional limit of the authorizing legislation.

ANNUAL PROJECT COST

31. Using an interest rate of 7 7/8 percent and an amortization period of 50 years, the annual project cost is shown in Table 6.

TABLE 6

ANNUAL PROJECT COST

TOTAL FIRST COST \$ 90,000

Interest and Amortization (7 7/8% - 50 years)	7,300
Maintenance (1.7 miles \$1,300 per mile)	2,200
TOTAL ANNUAL COST	\$ 9,500

PROJECT JUSTIFICATION

32. Preliminary studies, based on readily available data, indicate justification for detailed investigation. The estimated incremental annual benefits of \$ 11,000, when compared with the estimated incremental annual cost of \$ 9,500, provides a preliminary benefit-to-cost ratio of 1.16 to 1.00. The type of improvements proposed and the range of first cost estimates indicate that further study effort should be prosecuted under authority of Section 208 rather than Section 205.

WORK PROGRAM

33. Work items considered necessary in preparing a Section 208 Letter Report for Crab Tree Swamp Canal are given in detail below. Inclosure 2 is a work item summary for the required activities. Inclosure 3 is a study network analysis. Scheduling of the detailed studies is formulated on the assumption that study funding of approximately \$68,100 will be available for Fiscal Year 1983. The schedule provides for study initiation in the second quarter of F.Y. 83 and presumes a change from Section 205 to Section 208 Authority (Clearing and Snagging).

34. Preliminary Planning and Public Contacts. During the detailed study, close coordination between planning elements, local governmental representatives, and local residents will be maintained. A late stage plan formulation meeting will be held to obtain local views before selection of a recommended plan and finalization of the report. Additional public involvement will be developed as the need arises.

35. Hydrologic and Hydraulic Studies. Hydrologic and Hydraulic studies will be conducted in sufficient detail to identify flood prone areas and delineate the flood plains. Flood profiles for existing conditions and for various plans of improvement will be developed for the 2, 10, 25, 50, 100, and 500-year floods along with the Standard Project Flood utilizing available existing analyses and the HEC-1 and HEC-2 computer programs.

36. Surveying and Mapping. Surveys will be completed early in the study. A typical cross-section of the flood plain will be developed, and the larger trees which provide protective environmental cover will be field marked for saving.

37. Design and Cost Estimates. Design and cost estimates will be made in sufficient detail to enable the formulation of a best plan of action. Additional design efforts and refined cost estimates will be made for the selected plan.

38. Economic Studies. Economic projections will be made to determine future needs of the basin areas. Economic analysis will include comparison of costs and benefits. Damages and benefits will be computed based on field surveys conducted to identify the nature and extent of all flood damages. Damages will also be estimated for the future "no action" condition. Selection of a plan will be on the NED account in accordance with the Principles and Standards Guidelines.

39. Real Estate Studies. Investigations to determine cost of acquisition of necessary lands, easements, and rights-of-way of any alternative plan will be made.

40. Environmental Effects. Investigation of environmental and ecological aspects of the area and an effect assessment of all alternatives considered will be made in response to Section 122 of PL 91-611. An Environmental Assessment will be prepared in accordance with provisions of the National Environmental Policy Act of 1969. If the assessment reveals that the proposed plan constitutes a major Federal action

significantly affecting the human environment, an Environmental Impact Statement will be prepared.

41. U.S. Fish and Wildlife Studies. Proposed studies by the USFW are listed in inclosure 2. These studies will include the preparation of a planning aid report and a draft and final USFW Coordination Act Report.

42. Social Effects. All significant social effects of each alternative will be identified and assessed. Some of the items to be evaluated include: noise, displacement of people, aesthetic values, community cohesion, community growth, and relocations.

43. Preparation of Report. A Letter Report will be prepared within the scope of the Section 208 study authority.

44. Coordination. Cooperation and coordination will be maintained with local interests in the problem area and with appropriate State and Federal agencies during the course of the study. All appropriate State and Federal agencies and appropriate clearinghouses have been notified of study initiation. At least one public meeting will be scheduled during the course of the investigation.

CONCLUSION

45. Based on the results of this reconnaissance evaluation, it is concluded that sufficient flood problems exist on Crab Tree Swamp in the City of Conway, Horry County, South Carolina to warrant further federal investigation. It is further concluded that a feasible solution can be developed to alleviate flood damages and that the scope of the solution is within the purview and cost limitations of Section 208 of the 1954 Flood Control Act, as amended. It is further concluded that the scope of the problem exceeds design capacity of the previous flood control improvements which have essentially exceeded their life expectancy. The current improvements have been maintained in an adequate manner to provide design protection. The major cause of the existing problem is a result of changes in the use of land resources within the basin.

RECOMMENDATIONS

46. Based on the information presented in this report, it is recommended that \$68,100 be allotted to the Charleston District in Fiscal Year 1983 to perform detailed studies of Crab Tree Swamp Canal under the authority of Section 208 of the 1954 Flood Control Act, as amended. Costs for preparation of this reconnaissance report were approximately \$7,500. Request for reimbursement of these funds will be made by separate correspondence after total charges have been tabulated.



BERNARD E. STALMANN
LTC, Corps of Engineers

12 November 1982

KENNETH S. HOLT, MAYOR

COUNCIL MEMBERS

WILLIAM D. AVANT, JR.

FRANKLIN R. DEWITT

CLEVELAND L. FLAGGER, SR.

JAMES B. GOLDFINCH

SAMUEL W. PRINCE

MIRIAM H. WEBB



EXECUTIVE OFFICES

City of Conway
P.O. Box 1075
Conway, S.C. 29526

WILLIAM A. GRAHAM, JR.

CITY ADMINISTRATOR

LINDA K. HOLLAND

CITY CLERK

DOLORES BEVERLY

CITY TREASURER

J. WILLIAM GOBBEL

CITY ENGINEER

S. E. HENDRICK

BUILDING INSPECTOR

STEPHEN J. DRUTAR

PROJECTS COORDINATOR

September 9, 1981

Colonel Bernard Stalmann
Charleston District
Corps of Engineers
Post Office Box 919
Charleston, South Carolina 29402

Dear Colonel Stalmann:

Recent heavy rainfall, which has caused severe flooding in the Conway area, has brought a lot of attention to our over-taxed drainage system. As far as the City of Conway is concerned, one of the most important of these systems is what is known as the Crabtree Canal.

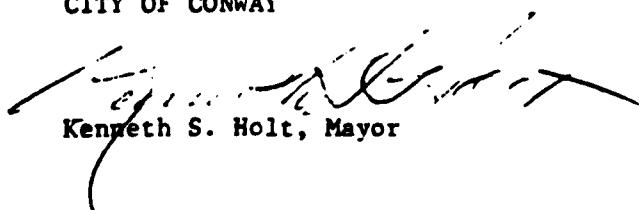
In the area that was severely flooded during tropical storm Dennis, Crabtree Canal is the central collector for all of the runoff. This particular area in question, see attached map, is in the North Conway area and was recently surveyed by Tom Tullis with the Corps of Engineers and Mel Schneider with the Federal Emergency Management Agency.

We request a survey be conducted by the Corps to determine the need and feasibility of improving the overall hydraulics of this canal. I realize that once the Waccamaw River reaches flood stage, there is very little that can be done, but if the canal can be improved, I feel that the chance of flash flooding, which occurs several times a year in this area, can be minimized.

Your consideration and effort in regards to such a study will be appreciated, and if the City can be of any service, please do not hesitate to call.

Sincerely,

CITY OF CONWAY


Kenneth S. Holt, Mayor

KSH:lh

Enclosure

cc: The Honorable Ralph H. Ellis, Senator
The Honorable M. Lois Earle, Representative
The Honorable Bob Childs, Chairman County Council

Inclosure 1



United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. BOX 12559
217 FORT JOHNSON ROAD
CHARLESTON, SOUTH CAROLINA 29412

Lt. Colonel Bernard E. Stalman
District Engineer
U.S. Army Corps of Engineers
P.O. Box 919
Charleston, South Carolina 29402

Dear Colonel Stalmann:

This letter is written in regard to the Reconnaissance study being conducted by the Charleston District Corps of Engineers in Crab Tree Swamp, Horry County, South Carolina. Our comments are provided on a planning-aid basis and partially fill our responsibilities under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

On June 1, 1982, a biologist from this office participated in a joint field inspection with representatives of the Charleston District Corps of Engineers. Our party concentrated on areas with known flooding problems as well as environmentally sensitive areas in the watershed.

Major Habitats and Existing
Fish and Wildlife Resources

The Crab Tree Swamp watershed is located in Horry County, S.C., within the Waccamaw River Basin. The mainstem of Crab Tree Swamp flows eastward, combining with Grier and Kingston Lake swamps and then flowing in a southerly direction to its confluence with the Waccamaw River. Crab Tree Swamp is wide, flat and was (prior to Corps Section 208 project in this area in 1966) wooded throughout its length. Since the flood control project was completed, a great deal of development and new agricultural activity has taken place in the area west of Conway. It is our understanding that the upper limit of the project is approximately 1 mile west of the U.S. 501 crossing of Crab Tree Swamp, while the lower limit has not yet been established; but would be somewhere in Kingston Lake Swamp. Currently only relatively narrow wooded sections, 100-200 yards wide, exist along the canal in the upper and middle portions of the area being studied.

for flood control measures. These areas are wooded predominantly by medium-aged chestnut oak, sweetgum, pine, red maple and occasional poplar. The wettest pockets contain tupelo, red maple and an occasional cypress. These areas in conjunction with adjacent fields and agricultural areas provide cover for a variety of game and nongame birds and mammals as well as a number of amphibians and herptiles.

The lower portions of the project area in the vicinity of Smith Lake and Kingston Lake Swamp are wooded with very water tolerant species including mature cypress and tupelo with an herbaceous layer dominated by lizard's tail. This is extremely high quality wetland habitat in Resource Category I (habitat is unique and irreplaceable on a national basis). It provides especially good habitat for small mammals including raccoon, beaver, mink, river otter, muskrat, etc., and a variety of herptiles including the endangered American alligator. Additionally this area is a valuable feeding and/or spawning and nursery area for a variety of warmwater fish species including redfin pickerel, bluegill, warmouth, redear sunfish, pumpkinseed, and yellow bullhead.

In addition to several plant species of special concern the federally endangered American alligator is known to utilize the general project area. Should this project develop beyond the reconnaissance stage, the Service recommends that the Corps coordinate directly with our Endangered Species staff to request an official list of endangered and threatened species that occur in this area. This request should be directed to the Area Manager, Fish and Wildlife Service, Plateau Building, Room A-5, 50 South French Broad Avenue, Asheville, North Carolina 28801.

Fish and Wildlife Related Problems

Portions of the Crab Tree Swamp have been previously channelized in 1966, degrading the stream and restricting overbank flooding with spoil banks on both sides of the canal. However, the denuded areas have naturally revegetated and at least partially restored the wildlife values and aesthetics of the project area. Enlargement of the existing canal through these areas would likely encourage farmers and developers to drain the adjacent wooded strips.

As previously stated under Section titled Major Habitats and Existing Fish and Wildlife Resources, the wetlands in the lower section of the project area are of extremely high value to fish and wildlife. Project intrusion into this area would have significant adverse effects on the fishery of Crab Tree Canal, Kingston Lake and even the Waccamaw River. The magnitude of the damage would be directly proportional to the length and depth of the channel excavated.

Fish and Wildlife Planning Objectives

If the Service is involved further in this project, we will adhere to the following general planning objectives:

- 1) Conservation and/or enhancement of fish and wildlife resources in the watershed.
- 2) Protection of endangered flora or fauna from adverse effects.
- 3) Maintenance and/or enhancement of recreational opportunities and aesthetics of Crab Tree Swamp and Kingston Lake Swamp.
- 4) Protection of the Waccamaw River from silt and/or contaminants that would result from this project.
- 5) Adequate mitigation and/or compensation for project damages to fish and wildlife resources.

Future FWCA Activities

The Service anticipates that the following activities and associated costs would be essential to adequately assess the fish and wildlife resources of the study area, evaluate the impact of the various alternatives and make appropriate recommendations. The funds requested are based on FY 83 costs.

<u>Activities</u>	<u>Biologist Days</u>
Field surveys	3
Habitat mapping and analysis	4
Literature review	1
Resource use	1
Evaluation of alternatives	2
Impact assessment, tradeoff analysis and identification of the plan most acceptable from a fish and wildlife standpoint	2
Interagency/public coordinated	3
Planning-aid report	4
Draft and final FWCA report	6
Total biologist days	26
Cost at \$215/b.d.	\$5,590.00
38% Service overhead	<u>2,124.00</u>
TOTAL COST	\$7,714.20

Accurate time and cost estimates for the aforementioned activities are very difficult until specific alternatives have been developed. If the extent of this project is determined to be greater than currently anticipated, special studies requiring additional funds may be required to complete our biological assessment and recommendations.

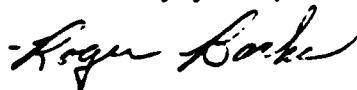
Conclusions

Deepening of the channel in the upper and middle portions of the project would cause significant damage through induced drainage of wooded wetlands. Our mitigation policy classifies habitat in these portions as Resource Categories II and III. Resource Category II has high value and calls for no net loss of in-kind habitat. Habitat in Category III is abundant, has medium to high habitat value and is to be mitigated with no net loss of habitat value and minimal loss of in-kind habitat value.

The lower sections (Kingston Lake Swamp and below) contain extremely high quality wooded wetland habitat in Resource Category I. Damage to this scarce habitat requires mitigation in-kind, with no loss of existing habitat value.

In order to avoid causing serious environmental damages and the resultant mitigative requirements, we recommend that the Corps thoroughly investigate nonstructural alternatives to flood control problems in the project area.

Sincerely yours,



Roger Banks
Field Supervisor

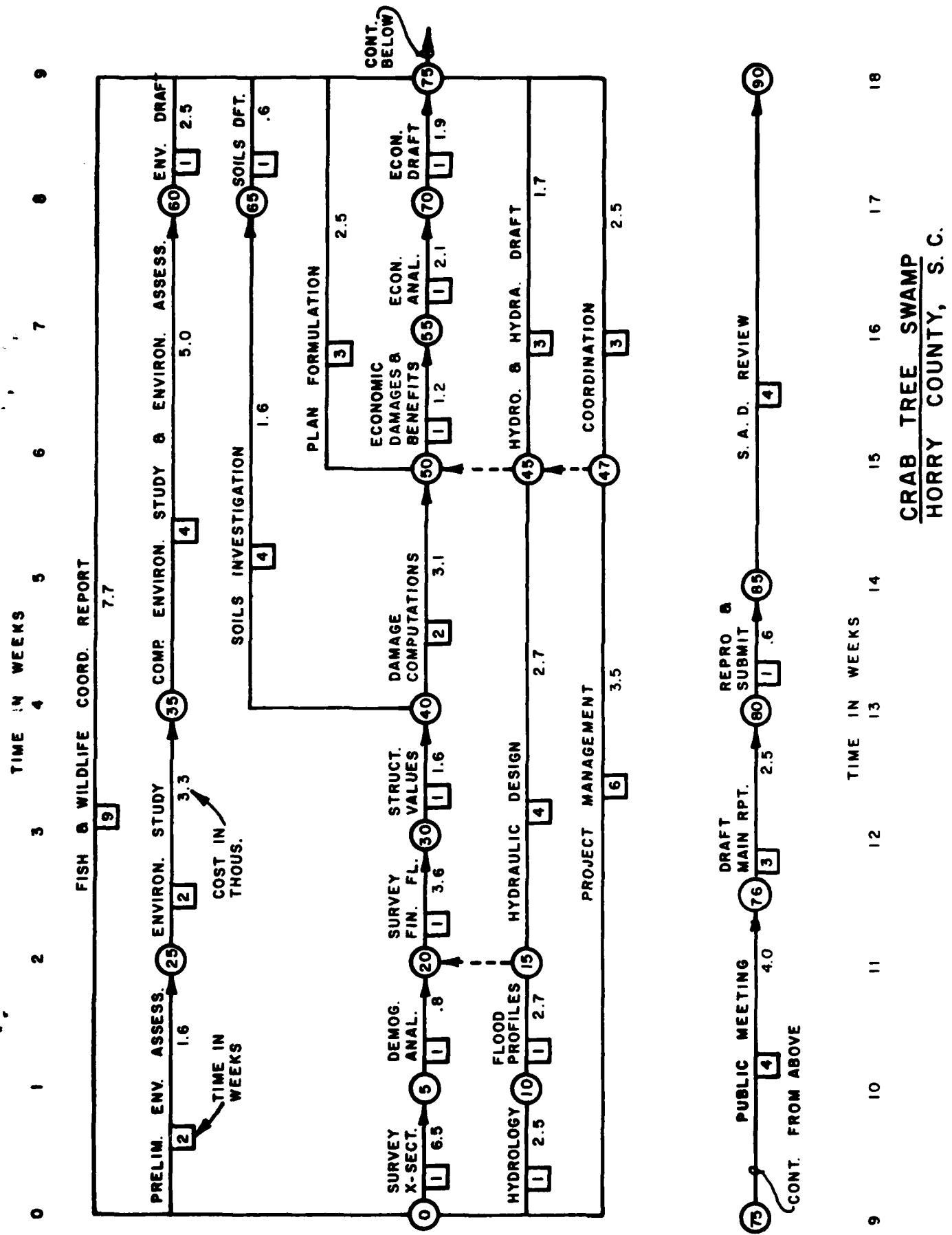
RB/HG/lm
cc: Ed Duncan, SCWMRD

CRAB TREE SWAMP
WORK ITEM SUMMARY

<u>ACT. NO.</u>	<u>ACTIVITY</u>	<u>COST IN THOUS.</u>	<u>CODE</u>
0-5	Survey, Cross-Section	6.5	EN-SS
0-10	Hydrology	2.5	EN-FH
0-25	Prelim. Environmental Assessment	1.6	EN-E
0-47	Project Management	3.5	EN-PS
0-75	Fish & Wildlife Coord. Report	7.7	F&WL
5-20	Demographic Analysis	.8	EN-PE
10-15	Flood Profiles	2.7	EN-FH
15-45	Hydraulic Design	2.7	EN-FH
20-30	Survey, Finished Flood Elevations	3.6	EN-PE
25-35	Environmental Study	3.3	EN-E
30-40	Structure Values	1.6	EN-PE
35-60	Complete Environ. Study & Environmental Assess.	5.0	EN-E
40-50	Damage Computations	2.9	EN-PE
40-65	Soils Investigation	1.6	EN-GF
45-75	H. & H. Portion of Draft	1.7	EN-FH
47-75	Local Coordination	2.5	EN-PS
50-55	Economic Damages and Benefits	1.2	EN-PE
50-75	Plan Formulation	2.5	EN-PS
55-70	Economic Analysis/Alternate Plans	2.1	EN-PE
60-75	Environmental Portion of Draft	2.5	EN-E
65-75	Soils Portion of Draft	.6	EN-GF
70-75	Economics Portion of Draft	1.9	EN-PE
75-76	Public Meeting	4.0	EN-PS
76-80	Draft Main Report	2.5	EN-PS
80-85	Reproduce & Submit Report	.6	EN-OS
85-90	SAD Review	-	SAD
	TOTAL	88.1	

1/ Activity cost are based on base salary rate X 1.08 to obtain effective rates. A cumulative general overhead rate of 40.75% and a construction general overhead rate of 57.73% were then applied to effective salary rates to obtain manday cost estimates:

(Base daily salary X 1.08 X 1.4075 X 1.5773 = Manday Cost)



INCL. 4

END

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